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Spirometry using race-neutral equations can improve asthma diagnosis and treatment

In the diagnosis of asthma, data from spirometry testing of patients is used in conjunction with reference equations to determine the degree and severity of a patient's case. Those equations, developed by the Global Lung Function Initiative (GLI), adjust for parameters such as age, sex and height. Until recently, they have also—mistakenly—adjusted for race "based on the flawed premise that racial groups have innate differences in lung function."

ATS endorses race-neutral equations

In 2023, the American Thoracic Society (ATS) changed its recommendation to support the use of race-neutral equations rather than race-specific equations, meaning that race or ethnicity should not be a factor in asthma diagnosis calculations.

The recommendation is based on their conclusion that using race as a parameter has no biological basis and that race-specific equations do not accurately reflect differences in the lungs. In addition, the ATS now believes that using race as a factor in spirometry interpretation can lead to underdiagnosis or misdiagnosis as well as undertreatment or inappropriate treatment, especially for individuals from underrepresented racial and ethnic groups. Further, race-neutral equations are now considered more accurate and reliable in assessing lung function.

Reinterpreting past results and diagnoses using new equations

Studies are now being published that compare previously obtained results based on race-specific equations with results based on race-neutral equations obtained today.

The article, "Global, Race-Neutral Reference Equations and Pulmonary Function Test Interprera-tion," was published by Alexander Moffett, MD, of the University of Pennsylvania and colleagues in *JAMA Network Open* in 2023. In their study, GLI race-neutral reference equations were used to interpret pulmonary function tests (PFTs) for 2,722 Black and 5,709 White adults. Results were compared to prior interpretations for those individuals conducted with race-specific equations, obtained between 2010 and 2020 at an academic medical center. Among the results, prevalence of lung restriction increased in Black individuals from 26.8% to 37.5%. Overall, results showed a significant increase in the number of Black individuals with respiratory impairments along with a significant increase in the severity of identified impairments. The authors noted additional work is needed to quantify the effect the equations would have on diagnosis, referral and treatment patterns.

To examine how spirometry results and patterns may change in children when transitioning from GLI race-specific to race-neutral equations, Erick Forno, MD, MPH of Indiana University and the University of Pittsburgh and colleagues studied spirometry results from 24,630 children, age 6 to 21 years, including 3,848 Black children (15.6%), 19,503 White children (79.2%) and 1,279 children of other races (5.2%), obtained between 2012 and 2022 at two large, academic, pediatric institutions. When switching between GLI equations,

pronounced differences in spirometry results and patterns were found, which markedly differed by race. For example, in adjusted models, Black children had approximately 3-fold higher odds than White children of changing spirometry pattern. The findings suggested that implementation of race-neutral equations is likely to change the treatment of children with chronic lung diseases, such as asthma, that are more prevalent in underrepresented minorities. The team's article, "Spirometry Interpretation After Implementation of Race-Neutral Reference Equations in Children," was published in *JAMA Pediatrics* in 2024.

Studies presented at AAAAI 2025

Three additional studies were presented at the 2025 annual meeting of The American Academy of Allergy, Asthma & Immunology (AAAAI), according to *medscape.com.*

To compare the use of race-specific versus race-neutral equations on subsequent asthma diagnosis in children, Wan Chi Chang, MS, a biostatistician from the Cincinnati Children's Hospital Medical Center and colleagues analyzed data from 1,533 children participating in the Childhood Asthma Management Program (CAMP, 1991-2012), the Cincinnati Childhood Allergy and Air Pollution Study (CCAAPS, 2001-2010), and the Mechanisms of Progression from Atopic Dermatitis to Asthma (MPAACH, 2016-2024) program. The researchers found that in comparison to results based on race-specific equations, the median percent predicted forced expiratory volume in 1 second (FEV_1) in Black children decreased by 11.9% in the CAMP study group, 13.5% in the CCAAPS group and 13.2% in the MPAACH group. In addition, the race-neutral equation identified 2- to 4-fold more Black children with asthma or asthma symptoms as having reduced lung function, increasing the likelihood of further testing and asthma detection. In addition to presenting their results during the conference, they published the article, "Race-Specific and Race-Neutral Equations for Lung Function and Asthma Diagnosis in Black Children" in *JAMA Network Open,* explaining their findings "have significant clinical implications and further support the universal use of race-neutral equations to increase the likelihood of identifying reduced lung function and improving the detection of asthma, particularly in Black children, promoting health equity."

An analysis of race-specific and race-neutral spirometry was presented in "Implications of Removing Race from Spirometry Reference Equations in Children with Asthma," by Lina Mahmood, MD, an allergy/immunology fellow at the University of Arkansas for Medical Sciences. Studying 7,138 Black, Latino and White children in Arkansas, US, the research team found that changes in lung function calculations had implications for asthma severity classification. In Black children, cases classified as moderate asthma more than doubled (from 11% to 27%) and severe cases nearly tripled (from 1.6% to 4.5%). However, changes were minimal for Latino children. In White children over 12 years of age, moderate cases dropped (from 10.0% to 5.6%) while mild cases increased (from 88.5% to 93.3%). "Race-neutral calculations could reveal more cases of underdiagnosed asthma in Black children, and somewhat less so in Latino children as well," Mahmood told *medscape.com*. "That can provide more opportunities for accurate therapeutic management and early identification of severe asthma, which may contribute to alleviat[ing] disparate asthma outcomes."

The study "Impact of Race-Based Spirometry Equations on Guideline-Based Management in Asthma Studies" was led by Cynthia Visness, PhD, an epidemiologist at Rho, Inc., a contract research organization that coordinates National Institute of Allergy and Infectious Diseases (NIAID) asthma and allergy research. GLI race-specific and race-neutral equations were applied to data from 2,076 children from 4 Inner-City Asthma Consortium (ICAC) studies. Children had a mean age [SD] of 11.5 years [3.4 years] and 62% were Black). Using the race-neutral equations, one-fourth of the Black children moved to a higher (worse) control level category and 13% would have been assigned to a higher medication step. In addition, among Black children not already at the highest treatment step, 18% would have been assigned a higher medication step. The team's analysis suggests "a significant proportion of Black children may be undertreated when using race-specific equations. Switching to race-neutral equations may reduce asthma morbidity among Black children in the US."

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